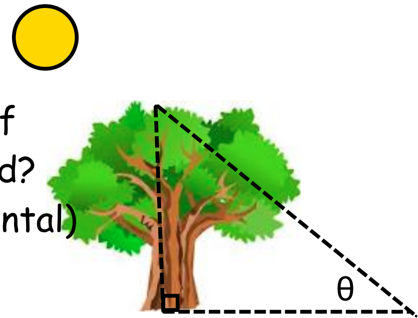
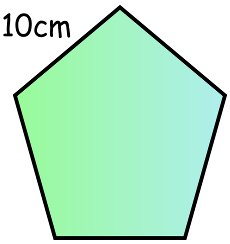
Precalc Warm Up # 6-2

1. A 40 ft tall tree is casting a 64 ft shadow. What is the angle of the sun to nearest 10th of a second? (the angle is made from the horizontal)



2. Find the area of the regular pentagon to 2 dec places.

10cm

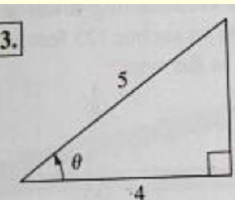


HW Questions: p. 329

EXERCISES 5.3

In Exercises 1–8, find the exact value of the six trigonometric functions of the angle θ given in the accompanying figure. (Use the Pythagorean Theorem to find the third side of the triangle.)

3.



In Exercises 9–16, sketch a right triangle corresponding to the trigonometric function of the acute angle θ, and find the other five trigonometric functions of θ.

9. $\sin\theta = \frac{2}{3}$

13. $\tan\theta = 3$

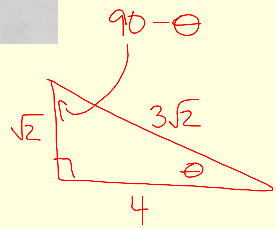
In Exercises 17–20, use the given function values to evaluate the required trigonometric functions.

$\frac{h}{o}$ $\frac{h}{a}$

19. $\csc\theta = 3$, $\sec\theta = \frac{3\sqrt{2}}{4}$

(a) $\sin\theta$ (b) $\cos\theta$

(c) $\tan\theta$ (d) $\sec(90° - \theta)$



In Exercises 21–24, evaluate the given trigonometric function by memory or by constructing an appropriate triangle for the special angles 30°, 45°, and 60°.

21. (a) $\cos 60°$ (b) $\tan 30°$

In Exercises 25–34, use a calculator to evaluate each function. Round your answers to four decimal places. (Be sure the calculator is in the correct mode.)

25. (a) $\sin 10°$ (b) $\cos 80°$

31. (a) $\cot\frac{\pi}{16}$ (b) $\tan\frac{\pi}{16}$

$\tan\frac{\pi}{16}$ $\boxed{x^{-1}}$

In Exercises 35–40, find the value of θ in degrees ($0° < \theta < 90°$) and radians ($0 < \theta < \pi/2$) without a calculator.

35. (a) $\sin\theta = \frac{1}{2}$ (b) $\csc\theta = 2$

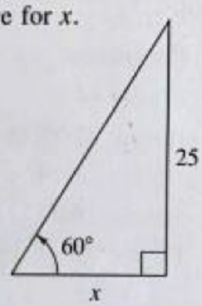
39. (a) $\csc\theta = \frac{2\sqrt{3}}{3}$ (b) $\sin\theta = \frac{\sqrt{2}}{2}$

In Exercises 41–44, find the value of θ in degrees ($0° < \theta < 90°$) and radians ($0 < \theta < \pi/2$) by using the inverse key on a calculator. Round your answers to two decimal places.

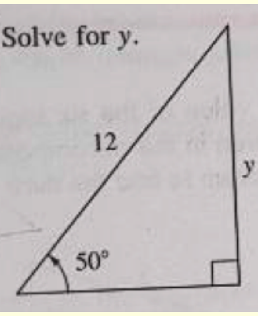
41. (a) $\sin\theta = 0.8191$
(b) $\cos\theta = 0.0175$

$\theta = \sin^{-1}(0.8191)$

47. Solve for x.

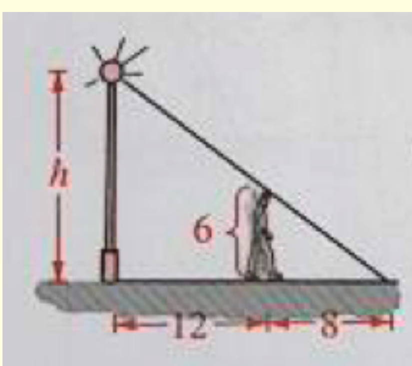


51. Solve for y.



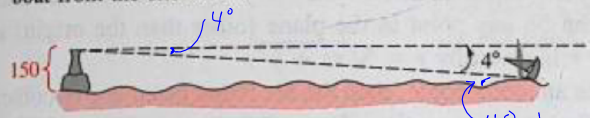
53. A six-foot person standing 12 feet from a streetlight casts an eight-foot shadow (see figure). What is the height of the streetlight?

Can just use similar △'s. :)

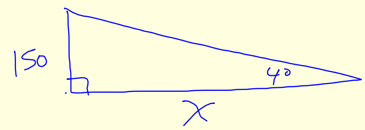


$$\frac{h}{6} = \frac{20}{8}$$

57. From a 150-foot observation tower on the coast, a Coast Guard officer sights a boat in difficulty. The angle of depression of the boat is 4° (see figure). How far is the boat from the shoreline?



4° by alternate interior angles Theorem.



$\tan 4° = \frac{150}{x}$ ...

In Exercises 59–64, determine whether the statement is true or false, and give reasons.

61. $\sin 45° + \cos 45° = 1$

$\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} \stackrel{?}{=} 1$

$\frac{\cancel{2}\sqrt{2}}{\cancel{2}}$

$\sqrt{2} \neq 1$

Definition of the Cosine of an angle:

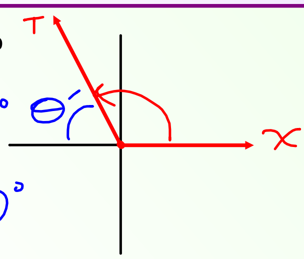
For an acute angle in a right triangle, the cosine of the angle is the ratio of the side adjacent to the angle over the hypotenuse of the triangle.

Extending the trig function definitions beyond right triangles using reference angles:

A reference angle is the positive, acute angle between the x-axis and the terminal side of an angle in standard position.

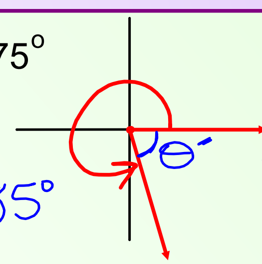
Ex: 120^{o}

$180° - 120°$



$\theta' = 60°$

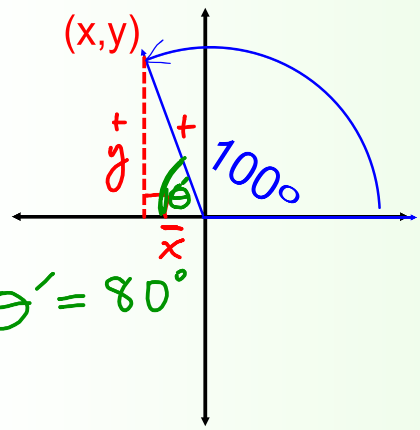
Ex: 275^{o}



$360°$
-275

$\theta' = 85°$

To find the cosine of 100°, first find the reference angle of 100°, then decide if the cosine is positive or negative in that quadrant.



$\theta' = 80^\circ$

$\cos 100^\circ = -\cos 80^\circ$

Check on your calculator:

$\cos 80^\circ \approx 0.1736$

$\cos 100^\circ \approx -0.1736$

Find without using notes or calculator:

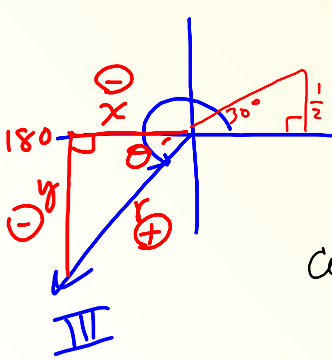
sin 210° $= -\sin 30^\circ$

$= -\frac{1}{2}$

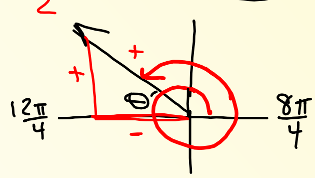
Quad ? III

+ or - ? −

θ' ? $= 30^\circ$



$\cos \frac{11\pi}{4}$



Quad II

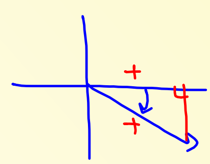
cos −

$\theta' = \frac{\pi}{4}$

$\cos \frac{11\pi}{4} = -\cos \frac{\pi}{4}$

$= -\frac{\sqrt{2}}{2}$

$\frac{h}{a}$ $\sec \frac{-\pi}{6}$



Quad IV

Sec +

$\theta' = \frac{\pi}{6}$

$\sec -\frac{\pi}{6} = \sec \frac{\pi}{6}$

$= \frac{2}{\sqrt{3}}$

$= \frac{2\sqrt{3}}{3}$

If θ is in the second quadrant, and $\sin\theta = \frac{1}{5}$, find $\tan\theta$

Two methods...

1) draw a picture:

2) Use an identity or two:

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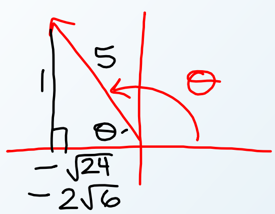
1) draw a picture:



$\tan\theta = \frac{1}{-2\sqrt{6}} \frac{\sqrt{6}}{\sqrt{6}}$

$\tan\theta = -\frac{\sqrt{6}}{12}$

2) Use an identity or two:

$\sin^2\theta + \cos^2\theta = 1$

$\left(\frac{1}{5}\right)^2 + (\cos\theta)^2 = 1$

$(\cos\theta)^2 = 1 - \frac{1}{25}$

$\cos\theta = \pm\sqrt{\frac{24}{25}}$

$\cos\theta = -\frac{2\sqrt{6}}{5}$

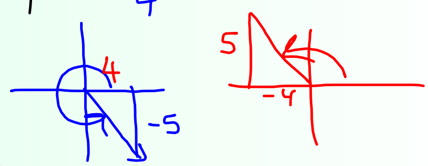
$\tan\theta = \frac{\sin\theta}{\cos\theta}$

$\tan\theta = \frac{\frac{1}{\cancel{5}}}{-\frac{2\sqrt{6}}{\cancel{5}}} \cdot \frac{\sqrt{6}}{\sqrt{6}}$

$= -\frac{\sqrt{6}}{12}$

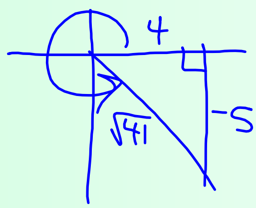
If $\tan\theta = -\frac{5}{4}$ and I ask you to find $\sin\theta$, you will need to know what quadrant θ is in, or at least be given other clues!

Why? $\tan \rightarrow \frac{y}{x} \rightarrow -\frac{5}{4} = \frac{-5}{4}$ or $\frac{5}{-4}$



Another clue: $\boxed{\cos\theta > 0}$ $\rightarrow$ IV Quad.

Now you can find $\sin\theta$?



$$\sin\theta = -\frac{5}{\sqrt{41}}$$

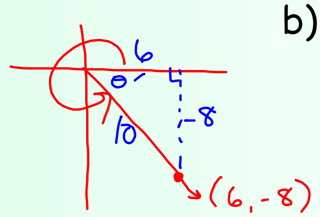
$$= -\frac{5\sqrt{41}}{41}$$

(6, -8) is a point on the terminal side of θ, find:

a) $\sin\theta$ b) $\cot\theta$

$$\sin\theta = -\frac{8}{10}$$

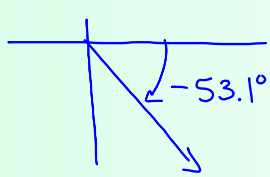
$$\sin\theta = -\frac{4}{5}$$



Find θ to nearest 10th of deg, on the interval: $[0^\circ, 360^\circ)$

$$\theta = \sin^{-1}\left(-\frac{4}{5}\right)$$

$\theta \approx -53.1^\circ$, but that is not on



$\theta' \approx 53.1^\circ$ $\theta \approx 360 - 53.1$

$$\boxed{\theta \approx 306.9^\circ}$$

HW: PC book

p. 339 box

HW Week 5: Wednesday
SL p. 312 (2 days) and PC p. 309, 319

Quiz Thursday: SL 9.1, 9.7
PC 5.1 - 5.4